



CHAPTER 4

**DPRK Information Strategy –
Does It Exist?***Peter Hayes***Introduction**

This chapter will demonstrate that Kim Jong Il has always had an information sector strategy, but it failed. As two cautionary tales about DPRK hardware and software ventures will show, the DPRK IT-sector technological strategy today is not new. Its origins and antecedents stretch back two decades—indeed, to the time that Kim Jong Il ascended to power under his father’s tutelage.

Along the way, the chapter will show that COCOM restrictions and U.S. sanctions on dual-capable technology transfer were largely ineffective in the IT sector for the whole period of its nuclear-weapons program. But the author also argues that the DPRK IT capacity has been isolated from the rest of the economy and relegated to a minor aspect of an early heavy-industrial structure dominated by metal-bending, crude-chemical processing, and rock-breaking and construction by mobilized mass

labor. This outcome was due partly to the specific IT strategy selected by the DPRK leadership and partly to the reluctance of DPRK industrial management to adopt automation technology and software in various sectors. Thus, the strategy failed to create a dynamic economy stimulated by information technology. Consequently, the DPRK finds itself as one of the least network-ready and most isolated societies on the planet.

In light of these lessons, the author suggests that the international community and the DPRK leadership should explore three niche-network opportunities in the early transitional period before the DPRK embarks on a structural adjustment. These are networks for niche markets in software and information processing, minerals exports, and interconnected network corridors.

In conclusion, the author notes that the current shift to proto-markets and technocratic planning in the DPRK runs the risk that old bad habits will reassert themselves. Information, training, and networked knowledge support systems can help the DPRK leadership to avoid these pitfalls. Finally, he suggests that supporting nascent social networks into the DPRK is crucial to social and political stability in the DPRK.

Cautionary Tales

Early Efforts to Make Integrated Circuits

By the early 1980s, the DPRK had already established its first factory to produce first-generation ICs.⁵⁸ To support

⁵⁸ This section draws on the following two sources: S. M. Deval, *Terminal Report on Project: DP/DRK/79/003, Establishment of Digital Bi-Polar Integrated Circuit Plant in DPR of Korea*, Electronics Trade and Technology Development Corporation Ltd, Government of India

this technology strategy, the DPRK drew on international assistance to create a training and research facility -- the subject of this section.

The project originated in 1979 -- the year that the UNDP first established a "window" in Pyongyang and the DPRK became eligible for UNDP assistance. The DPRK Government requested the UN Industrial Development Organization (UNIDO) in Vienna to formulate a project to construct an IC pilot plant (modeled on a UNIDO project in Romania) for the Electronics Institute within the DPRK Academy of Sciences.⁵⁹

While UNDP pondered on whether such a plant was the kind of project that UN technical assistance should be supporting in the DPRK, UNIDO proceeded to identify potential suppliers for the project by contacting no less than 56 companies, four of which responded. In May 1981, UNIDO selected ETTDC, an Indian Government firm, to support the project, largely due to its ability to circumvent COCOM sanctions and supply the requested equipment.⁶⁰

Enterprise, New Delhi, no date but circa early 1987; and R. El Haddidy, G.P. Putnam, *Establishment of a Pilot Plant and Training Center for Bipolar Digital Integrated Circuits*, Draft Project Terminal Report, United Nations Industrial Development Organization, Vienna, February 27, 1987.

⁵⁹ Haddidy, op cit, p. 3, p. 8.

⁶⁰ The other offers were from Semcotec and Lemis (both Austrian firms) for \$14 million and 13.5 million respectively; and Promashexport (former Soviet Union), no costs provided. ETTDC's winning offer was \$5.9 million. Other western firms declined to enter bids due to COCOM export embargo restrictions. *Ibid*, pp. 11, 29. ETTDC was selected for its basic competence even though it had never actually installed such a plant elsewhere. ETTDC planned to use western suppliers for the crystal pulling and mask making components of the project, but these eventually pulled out due to COCOM, resulting in the removal of these elements from the project altogether. ETTDC attempted to fill this gap with a Japanese supplier in 1983-4, but

Indeed, the UN consultant who reviewed the draft project in 1981 concluded that the proposed plant could make up to 50 million units if it operated in three shifts, and that it would be difficult to control and restrict the use of the end product to industrial automation, whatever was said by the DPRK.⁶¹ At the same time, UNDP questioned whether the plant was appropriate for the DPRK development strategy (as a poor country), and reiterated concerns that the plant was a production rather than a pilot factory for research and training. However, after further review and cutting back on the scope of the pilot plant,⁶² the project went ahead in a comedy of errors typical of aid projects in the DPRK at this time.

The plant itself was delivered to DPRK over the period June 1983 to October 1986, and was installed in a building constructed by October 1986. The plant was transferred to the DPRK government in December of 1986. As is often the case in the DPRK, the building was not suitable for its

eventually, this company advised that it too was blocked by COCOM. UNIDO tried to find alternate suppliers (Jenoptic from East Germany and Metronex in Poland), but they proved too expensive and unable to supply the specific IC technology required. *Ibid* p. 29 and see below.

⁶¹ Pp. 12-13.

⁶² The original scope covered four steps: crystal pulling to make polished silicon wafers from sand; mask making whereby a set of chrome-plated masks for each layer of the IC are made from a circuit design using a precision-optical process; wafer processing in which several circuit layers are deposited on a silicon wafer using masks so that a wafer contains hundreds of IC chips; and assembly and test, wherein the finished chips are separated from the wafer and bonded to lead frames, and then connected with wires and terminal pins in plastic to produce the IC for testing. The final scope eliminated the more demanding first two steps, not least because the available supplier (ETTDC) could not provide these technologies). The UN also questioned the DPRK request for gold doping for 74H IC series for what was ostensibly a training plant.

end use, being made of masonry and rough plaster, that created dust inimical to the production process of the plant. In addition, most of the electrical wiring, paint, windows, and fixtures were unsuitable for the facility, and the power supply for the plant proved to be highly unstable with severe voltage spikes.⁶³

The ETTDC also trained the DPRK Electronics Institute staff at the Indian Institute of Technology in Delhi. However, the DPRK graduates were insufficiently trained in IC technology, reducing the number of trainees from 10 to three to four at a time. Two training sessions were conducted—one in August-October 1983, and a second in November 1983-January 1984. However, the lack of English language skills in the DPRK trainees combined with late arrival for training in India rendered the training almost useless. Other than a study tour of IC production facilities, all the actual training was “hands-on” at the plant during construction and testing phase in the DPRK itself.⁶⁴ The early test runs showed that the DPRK could produce 7400 and 7600 ICs provided that the wafer and masking components were provided from outside sources. By January 1986, a team of 19 DPRK engineers had made 5841 chips at a 72 percent yield rate. By the end of 1986, more than 30,000 units had been processed, with a 70 percent plus yield rate.⁶⁵

This bit of historical insight demonstrates two important facts that remain salient today. First -- as will become evident below -- today's DPRK IT-sector technological strategy is not new. Its origins and antecedents stretch back two decades -- indeed, to the time that Kim Jong Il ascended to power under his father's tutelage. Thus,

⁶³ Ibid, pp. 20-25.

⁶⁴ pp. 26-28.

⁶⁵ p. 38.

whatever its strengths and weaknesses, Kim Jong Il has crafted an IT strategy for the DPRK economy for as long as he has been in charge.

Second, COCOM restrictions and U.S. sanctions on dual-capable technology transfer were always ineffective in the IT sector in relation to the DPRK for the whole period of its nuclear-weapons program. At best, they slowed the number and timing of production of computer and related equipment to economic agencies in the DPRK. In the author's observation, leading party organs and high-level agency officials have always had current or next-generation computers available to them. Line agencies have had second, third, fourth generation computers in use in production facilities (for example, in the power dispatch center in Pyongyang). Finally, researchers in the DPRK are always starved for computing power but even they have low-end computers to run CAD/CAM and other software.

If the leadership and line agencies always had at least some computers, one can infer that the military-industrial complex has had state-of-the-art imported computer technology for its own research and development programs. To suggest otherwise is laughable, especially today. This makes continuing US restriction on transferable MTOPS to the DPRK in small computers to the equivalent of a 386 machine simply irrelevant. It is the political equivalent of a gang boss muttering an invective to a rival gang across the street. It may be heard, it may irritate, but it is more about the gang boss talking to himself than about debilitating the rival.

A personal anecdote may serve to highlight this irony. When hosting a DPRK study tour in the United States a few years ago, we managed to separate the salt-of-the-earth engineers from the “environmental journalist”-cum-

controller who we referred to as the “gorilla,” his function being so plainly evident. We took the engineers to Cody’s, one of the most famous American bookstores and let them loose, saying that they each had \$100 to spend. Plainly frightened, they headed past the fiction shelves, past the non-fiction shelves to the only “safe” section ... computer software. They carefully chose software manuals and went to the cashier’s counter. I looked at each manual and found most had a CD-ROM tucked inside the back cover. I found that in the tiny print explaining that export of this software is not permitted to, amongst others, the DPRK. I had to explain that in the land of free speech, I could not let them buy and take home these books. Unfortunately, the gorilla turned up very flushed and angry at that moment, so the experiment in freedom was terminated promptly.

Commercial Software or Industrial Modernization

In the mid-eighties, the DPRK established the PIC -- one of seven key institutions known today to work in the software sector in the DPRK.⁶⁶ The PIC was described as a “computer systems development and training center” which would establish an *Information, Planning, Analysis and Management Group* that in turn would develop computer-based, modern management techniques. PIC was also to create a *Computer Group* that would: promote use of computers by DPRK government and industries, act as a

⁶⁶ The other software activities are: Academy of Sciences; Korea Computer Center; Silver Star (Unbyol) Laboratories; Kim Il Sung University; Kim Chaek University of Technology; Pyongyang Computer Technology University. See Asian Technology Information Program, *Computer Software R&D in North Korea*, ATIP report 02.023, June 5, 2002, at www.atip.or.jp (commercial service). See also the pro-DPRK website <http://www.korea-np.co.jp/pk/> for other details of these organizations released to promote their wares. This web site states that PIC was set up in 1986, whereas in the early nineties, the DPRK told the UNDP that it was set up in 1989.

“technology transfer” funnel or vehicle into the DPRK, train personnel in applying computers in government and industry, and develop software engineering and computer systems to be applied in industry.⁶⁷ In phase one, management training combined with computerized support systems were to be delivered in the textiles, coal, and heavy machinery sectors. Specifically, the targeted entities were Pyongyang Textile Combine, Taean Heavy Machine complex, and Anju Coal Mine. In phase two, the steel and cement industries were next in line.

PIC was to work with the UNE to help these pilot enterprises to develop a new management culture for DPRK industry based on automated management systems. Each industry was to create a 15-person management assistance group for training and to be equipped with a LAN-networked computer system. They were to be trained in management information systems, operations research and optimization; production scheduling and control; decision support systems; and transport and distribution system. After training and implementation, each MAG was to hold workshops for other industrial entities in the same sector.

However, PIC pursued a computer-focused, hardware-led training program and failed to determine early on what steps an enterprise must take to apply computer-based

⁶⁷ UNDP, Project Achievement Form, *Democratic People's Republic of Korea DRK/89/002/A/01/99—Establishment of PYONGYANG INFORMATICS CENTRE (PIC)*, mimeo, circa 1994, covering an untitled project evaluation February 1994 mission report (version 2) submitted to UNDP New York in March 1994. These reports were never published, due in part to sensitivities concerning the technology transfer component of the project noted in the cover memo: “Given the scrutiny that DPRK has received of late with regard to technology transfer especially where equipment may be concerned, it may not be wise to publicize certain achievements in this area.”

management. Thus, although UNE sent trainees to Geneva, China, Switzerland, and the United Kingdom to study foreign markets and marketing research, international financial markets, and enterprise management in free-trade zones, it played second fiddle to PIC. UNE was unable to match its management insights with enterprise management information strategies and needs, let alone determine the requisite hardware and software support for information strategies to meet these needs that PIC should have supported. The industrial applications would have demanded that UNE and PIC identify enterprise-specific management information problems and solutions and only then design and implement enterprise-specific software and hardware support systems including data collection, entry, verification, and adequate training and support for managers and technical operators. Consequently, by the end of 1994, no computers had been installed in the three pilot industries. As the evaluation mission stated, the “target beneficiaries were possibly rushing into the process of computerization, without having first identified, reviewed and prioritized the management information problems which affect the quality of analysis and decision-making by management in their respective organizations.”⁶⁸

In reality, PIC was likely never much motivated to automate DPRK industry. In fact, PIC had formed in 1986, not 1989 as the UNDP was at first told, and began with a joint venture between the DPRK and Korean-Japanese interests called Pyongyang International Computer Management Centre.⁶⁹ In 1988, the then head of PIC had visited Japan to explore setting up a Tokyo marketing office leading to an initial investment of US\$0.5 million

⁶⁸ Ibid, p. A5.7.

⁶⁹ ibid, p. B2.2.

and recurrent costs of US\$ 0.24 million per year and sales in Japan of US\$ 80,000 per year. By 1989, PIC had 30 personnel.

UNDP's US\$ 692,000 for PIC (of which US\$ 340,000 was to be spent on computer hardware) by 1994 had bought PIC a building and an increased staff of 80, of whom 70 were technical personnel. Indeed, not only a building for a computer center, but a hotel, restaurants, bar, shop, swimming pool and recreation facility (!). Trainings of PIC personnel in computer-based project management to enable PIC to support the three pilot industry automation efforts were held in India in Ahemadabad in January 1991. Sixty of the 80 technical personnel at PIC who constitute PIC's Computer Group were trained overseas in project management, database management, micro-computer networks, UNIX, and computer-assisted software engineering (CASE). Another 15 technicians trained in Bangalore and New Delhi, Osaka, and Singapore in computer technology.

The primary market for the computer group was software development and consulting, both in Japan and domestically (although the only known example of domestic work is the preparation of a database for the coal mining industry). Not only had PIC developed important Korean language software (including DOS interface/word processing/desk-top publishing) but also had a niche market for bespoke entertainment software in Japan. It had undertaken software projects for clients including a publisher, hotel reservation system, insurance data handling, container port management, etc., generating annual revenues of \$200,000 from Japan in 1993. Clients were not just Korean-Japanese but included Nissan Corporation.

PIC was highlighted at the 2001 Pyongyang Computer Program Expo and claims software production and marketing successes (see Figure 4.1 and Table 4.1). Reportedly, PIC's building burned down but was rebuilt -- presumably as shown in the marketing image available today.

What lessons may be learnt from this glimpse into PIC's origins? First, the close link with Koreans resident in Japan is evident, both for investment and for marketing.

Second, the difficulty of linking the DPRK software capability either backwards or forwards in an organic relationship to DPRK industry is obvious. In part this difficulty arose from PIC's own early commercial origins and orientation, whatever song and dance it had to perform about industrial management to obtain UNDP's funding. Thus, PIC was always inclined to pay lip service to industrial management but to be motivated primarily by external software markets, especially in Japan.

But their inability to move automation into factories quickly also likely reflects the bureaucratic resistance of sectoral management to automated decision-support systems that entail redistribution of information within industrial enterprises. Opposition to automation of traditional metal-bending and batch-production process plants on the part of plant-level management (not to mention artisan workforces) is well known in both the West and the former Soviet countries. There is no reason to expect DPRK industry to be any less hide-bound or more inclined to adopt systems that enable top management to interrogate directly the production decisions and activities in the plant. Of course, there are many reasons for the moribund state of DPRK industry today—including the command-and-control allocation of resources, the lack of

markets and legal institutions, opacity in almost every aspect, the withdrawal of external support in the early nineties, the costs of sanctions, bad land-use decisions (leading to erosion and deforestation), bad luck (the floods and droughts), and insecurity (of the regime which clings to a police state, and the military pressure with associated diversion of resources from economic to military priorities).

Nonetheless, this experience bears directly on the prospects for reform, transition, and structural adjustment in the DPRK today in that it reveals how hard it will be to prepare the DPRK to embrace a networked, speeding world.

Figure 4.1. Pyongyang Informatics Center Advertisement

PICTURE

Pyongyang Informatics Centre

PIC is the center which is developing computer programs in DPR Korea.

"INSIK" (OPI)
Korean, English, Japanese, Chinese, Vietnamese, etc. can be converted into any paper files (Japanese, English, Chinese, Vietnamese, etc.)

DTP
Simultaneously creating and editing Korean, English, Japanese and Chinese characters on DTP.

"Karaoke" System
Digital operation system by Karaoke signs, microphone, computer, etc.

"Gohyang"
Database Management System
Customization of database system according to user needs

CAD
Architectural Design Support System as 3D Modeling, Architectural Design, Electric Supply, Construction Planning System, Architecture Drawing Test, etc.
Clothing Design Support System
Clothing Design Support System such as clothing pattern, color, size, matching
Clothing Design Support System

Head Office: KyongsangDong, Pothong District, Pyongyang DPRK
Branch Offices:
 Singapore: 10 Anson Road #17-10 International Plaza Singapore 079903
 Tel : (65)2277096 Fax : (65)2277069
 Japan: 3-17-7, Nishi Kasai, Edogawa-ku, Tokyo, Japan
 Tel : 03(3680)4081 Fax : 03(3680)4164

Table 4.1. Selected Programs Developed by Pyongyang Informatics Center

| Program name | English name | Content |
|---------------------|--------------|--|
| Changdok | Changdok | Multilingual word processor – Korean, English, Japanese, <i>Hanja</i> (Chinese characters), Russian |
| Tangun | Tangun | Standard Korean character program |
| Jonja-chulpan-chege | <u>DTP</u> | Multilingual DTP program (Korean, English, Japanese) |
| <u>Inshik</u> | | Korean word recognition program (recognition rate: 95%) |
| <u>Gohyang</u> | | Database Management System (DBMS) |
| Sanak | | Architecture Design Support System; Fully supports architecture design, as 3D modeling, architectural technology design, construction framework design, electric supply work design, heating system, architecture drawing test, etc. |

Source: <http://www.korea-np.co.jp/pk/>

Networked North Korea – An Oxymoron?

Anyone who has traveled or worked in the DPRK having lived in the informational hyper-velocity and hyper-saturated world of the hyper-linked Internet, let alone the Enabled Internet⁷⁰ or the Extended, Enabled Internet, will be feeling distinctly surreal at the thought of a networked North Korea. Of course, the view standing in Pyongyang is always different to that standing in a western city, not least because it resembles Gotham City. At night in Pyongyang, it is hard to not think of Batman flitting around the Juche tower and swooping around the Koryo Hotel in search of Batwoman or more likely, the Joker. In Pyongyang, what you see is what you get -- concrete buildings, miles of them. Eventually, you realize that what you see is actually epi-phenomenal and that the real Pyongyang, the real DPRK -- even in rural areas -- is subterranean, below the surface, invisible to peering eyes or ears. Batman would be right at home in a North Korean cave. The grim realities of surveillance, vertical compartmentalization, opacity, dismal telecommunications connectivity, and poverty are not characteristics of a highly networked society on international standards.⁷¹

⁷⁰ Enabled Internet refers to the ability of distributed users (including objects) to process information and to coordinate and communicate directly without relying on central servers to process information; Extended Internet refers to the trend for the Internet and the enabled Internet to network classically physical activities or sectors such as energy delivery grids, construction, mining, or heavy industries to obtain major efficiency gains. The Enabled Internet has arrived (post-Napster); the Extended Internet is arriving (sensor –based, Internet enabled decentralized electricity production and demand side management of electric power grids).

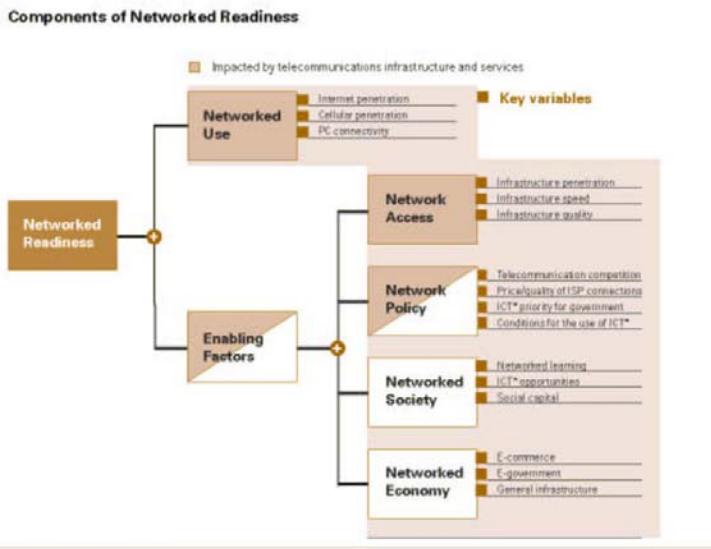
⁷¹ See G. Kirkman et al, “The Networked Readiness Index: Measuring the Preparedness of Nations for the Networked World,” in *The Global Information Technology Report, Readiness for the Networked World, 2001-2002*, Oxford University Press, New York, 2002, available at: http://www.cid.harvard.edu/cr/pdf/gitrr2002_ch02.pdf

In a systematic accounting of national networked readiness (see Figure 4.2), the DPRK does not even appear (the ROK is ranked twentieth globally on the combined index of network use and enabling factors, and fifteenth and twenty-fifth with regard to these two indices respectively).⁷² The DPRK Internet-cellular penetration is close to zero, as is PC connectivity, so network use is close to zero. Network access is almost zero due to lack of infrastructure, and slow speed and poor quality where connectivity exists. The factors that constitute a favorable network policy are systematically absent in the DPRK. The networked economy is similarly notable for the few tiny exceptions noted above. Only in the networked society factor does the DPRK have a slight enabling capacity—there is some social capital in the learning centers of the various academies and institutes, some nascent networked learning opportunities (linked databases, the computer learning room at the People's Grand Study Hall, and some limited ICT hardware and software production capabilities.

⁷² See A. Mansourov and A. Matsegora, *Telecommunications Sector in the Democratic People's Republic of Korea (DPRK)*, mimeo report to East-West Center, April 1999.

Figure 4.2. Networked Readiness and the Impact of Telecommunications

Figure 1: Networked Readiness and the Impact of Telecommunications



Source: S. Beardsley *et al*, "Telecommunications Sector Reform—A Prerequisite for Networked Readiness," in G. Kirkman *et al*, "The Networked Readiness Index: Measuring the Preparedness of Nations for the Networked World," in *The Global Information Technology Report, Readiness for the Networked World, 2001-2002*, Oxford University Press, New York, 2002, p. 119.

In Pyongyang, telephones work reasonably well including to overseas locations (at extraordinary prices). Outside Pyongyang, telephony is a haphazard and time-consuming activity that only works in one direction -- out if the caller is lucky. Even major industries rely on antiquated telephony -- for example, the central power dispatch center relied on operator-assisted, hand-cranked telephones to connect regional power centers. Lightning and electric power grids move faster than such communication systems, leaving the grid open to cascading failures.

Nonetheless, early indicators may be observed that an electronic or e-DPRK is emerging. Cell phone signals can be picked up in Pyongyang. Kim Jong Il surfs the Blue House Web site regularly. European NGOs are allowed to use satellite phones. An Internet café opens in Pyongyang. North Koreans say that a new e-mail service is opening shortly in Pyongyang (land lines to servers in China have been used for e-mail/Internet access for some years after the DPRK shut down the few satellite phone links to international agencies). Reportedly, users will pay \$500 per year to send e-mail out, and another \$500 to receive e-mail (!). North Koreans serving international organizations around the world may now receive Hotmail. A selective list of such indicators of change is provided in Table 4.2. (excerpt from the excellent coverage provided at <http://www.vuw.ac.nz/~caplabtb/dprk/august02>).

So which is it? A virtual DPRK connecting to the external world and wired internally, or a concrete bunker DPRK that repels networks that approach its force field like they are mortal enemies arrayed along the DMZ?

In this regard, the following three lines of enquiry might inform a more systematic enquiry into alternate DPRK futures. Given the over-determined nature of every aspect

of the DPRK -- geopolitical, economic, technological, ecological, cultural, and political -- there are too many significant and highly unpredictable driving forces that will ambush the two Koreas and the great powers that exert influence in the Peninsula to make predictive forecasts.⁷³ These three factors are:

- 1) Early niche market networks;
- 2) Central planning and line agency networks in creation of proto-markets; and
- 3) Opening access to social networks.

Niche Networks

Here, one can refer to the need to provide networked communications and information support to the high-value development opportunities in the DPRK in the early phase of economic transition but before full-scale structural adjustment.

Given the DPRK's factor endowment and current location in a low-level equilibrium trap in which the marginal value of labor is zero or negative, the only way to move forward is piecemeal. Already, niche markets for existing DPRK resources exist. It is critical to bring these into active export status in order to both provide an alternative source

⁷³ See *Scenarios for the Future of U.S.-North Korean Relations: Engagement, Containment, or Rollback?* Report on the Workshops held at the Nautilus Institute, April 30-May 1, 2002 June 24, 2002, available on-line at <http://www.nautilus.org/security/Korea/index.html>

of foreign exchange for the DPRK party and military elite, and to commence a process of investment in commercial activities. Some established possibilities are:

Establishment of labor-intensive, information-intensive businesses in the DPRK

Such enclaves devoted to software and information-processing sweat shops would need the other simultaneous, limiting conditions on development lifted at their locations -- reliable power and telecommunications infrastructure, business-oriented training of existing software engineers and workforces, language training to break into non-Korean language markets. The Indian software export and Caribbean information-processing industries are models that the DPRK might emulate and, working in tandem with ROK software and information processing firms, are the most likely productive strategies. In less than a year, this strategy might employ upwards of 20,000 skilled North Korean laborers split perhaps 80:20 in serving Korean versus international (primarily Japanese) markets and earning on the order of US\$ 0.1-0.2 billion per year.

However, it is highly improbable that such a strategy would lead to a "leap-frogging" knowledge sector in the DPRK. It would work quickly precisely because it can be implemented at a micro-economic level without achieving backward and forward linkages to the rest of the economy. A knowledge sector implies fundamental and applied research and development capacities that are integrated into all sectors of the economy and are embedded in global networks of excellence. Clearly, the DPRK lacks the networked readiness -- the enabling factors as well as the network use -- that would support a knowledge sector in the

DPRK. It will take decades not years for the DPRK intellectual sector to recover from the half century of almost complete isolation from universal science and applied technological development in domestic and multinational industry; and for reconstituted DPRK fundamental and applied R&D capacities to articulate with a market economy.

Reactivation of mineral exports

This is a second niche market that could be implemented rapidly on a discrete basis. In 1994, the DPRK identified eight mines that could be refurbished and recommence production for export of minerals such as magnesite and zinc. An example is given below in Figure 4.3. However, each mine is basically moribund and requires that the limiting conditions such as lack of power (on the order of five to ten megawatts per mine), rail and road infrastructure, mechanic equipment to mine, process, and transport ore, be overcome simultaneously. Although the global minerals sector is in the doldrums, DPRK mines may be competitive in specific markets. It should also be possible to create innovative frameworks in the early transitional period wherein the DPRK net earnings on minerals exports could be directed to verifiable humanitarian and market-oriented small-scale industrial development in towns and farms surrounding the mine-head. This approach would ensure that the earnings are not dissipated in the military-industrial complex or diverted to military modernization. Each mine may require US\$ 5-10 million of external investment from a foreign partner to refurbish and could earn a net US\$ 1-2 million per year.

As with information processing and software shops, mining industries often do little for local development beyond opening up regions with transport and communications infrastructure. Indeed, mines often bring negative environmental impacts to local communities and social disruption in the wake of camp followers and imported workforces. In the DPRK, however, such valid concerns (DPRK mines are notoriously polluting of rivers, and occupational health and safety practices in DPRK mines are almost non-existent) may be offset both by introducing global standards and by directing revenues to local development.

The major networking needs for the implementation of the minerals-sector strategy are not very demanding. A satellite phone at the mine head office and at the export facility, combined with telecommunications connectivity with the external joint venture partner would suffice. Internally, a transparent set of accounts that meet international business standards adhered to by an external investor would need to be supported electronically, while the DPRK management would need proper training in minerals economics and markets in order to ensure that DPRK interests are properly served in the terms of the transactions implemented by a joint venture. Such analytical capacity needs to be created in the DPRK mining corporate management -- but the autonomous-from-Pyongyang requirement should be feasible. For in reality, DPRK quasi-statal firms have operated in this fashion in responding to external markets without reference back to Pyongyang.

Inter-connected Network Corridors

Re-connecting railway lines and laying new regionally inter-connected pipelines and power grids is an important

opportunity for the DPRK to gain rent on right-of-way corridors from the primary users of such infrastructure stretching all the way from Norway to the ROK.

The railway connection appears to be moving fastest, followed by power grids pushed by the geopolitical pressure of completing the KEDO light-water reactors followed last by gas pipelines that will cost many billions to construct over decades.

Inter-connected networks can operate as if the DPRK itself does not exist provided the users pay rent to the DPRK for use of the corridor. But the DPRK will gain a number of entry points in each of these inter-connected networks from which it can obtain service (ship or receive goods, import or export power -- especially the KEDO LWR power, and obtain gas supplies). As with the other two niche-network markets, these physical grids will have their telecommunications and Internet enabling and extended information dimensions. But unlike the other two discrete opportunities outlined above, the critical dispatch functions will be conducted by a regional dispatch center that the DPRK will not control nor be able to take hostage. For investors in such large-scale networks will require dispatch be embedded in reliable infrastructure and staffed by operators not subject to DPRK political and cultural practices.

Preparing for Structural Adjustment

The DPRK is not prepared to undertake full-scale structural adjustment. It will not do so until the United States removes it from the list of terrorist states and allows it to use the World Bank to enable its adjustment and to act as

an intermediary for major bilateral aid (Japanese reparations) and for private investors and lenders. The most important steps are to establish a new macro-economic framework for markets, the rule of law, and educational strategies for retooling the literate but exhausted population. This chapter will not address the telecommunications reforms and strategies that are needed to support structural adjustment, nor the creation of fast-track special zones such as that just announced for Sinuji on border with China. Rather, it will point to the need for the central planning apparatus to shift from its current subordination to the Korean Workers' Party to an independent technocracy modeled after the ROK Economic Planning Board during the ROK's own transition from a rentier landlord dominated state to an industrial accumulating society in the 1958-65 period.

As the DPRK shifts from the extraordinarily centralized, politicized and personalized decision-making system embodied in Kim Jong Il and the party apparatus to a legal-bureaucratic planning and policy-making system reporting to the Prime Minister's office, the conceptual framework and software systems that support decision-making will be crucial to outcomes. The risk is that the old physical input-output modeling with associated top-bottom physical databases will remain the basis of decision-making and resource allocation; whereas what is needed are price-based models that simulate the behavior of proto-markets as state enterprises are forced into competition with each other instead of running vertically and horizontally integrated monopolies.⁷⁴ The availability of computing power,

⁷⁴ Note the type of software advertised at the Beijing Expo: “*Puhung*” (reconstruction), a support program for drawing state economic plan, realized automation of calculation duties, which occupied 80 percent of the process of state economic planning. “*Nalgae*” (wing), a support program for calculation of balance between sectors of the national

copious information, and central planning software (as was advertised at the Beijing software expo) is no substitute for the decentralized decision-making by millions of people who optimize their own decisions when faced with price signals in local markets. What is needed more than central planning is communication of prices, especially differential prices, so that local consumers and producers can make well-informed and timely decisions of their own in markets. Relatedly, starting up local markets is the prerequisite for the existence of such price data, without which communications infrastructure is meaningless in the DPRK.⁷⁵

The second risk is that the new technocracy will try to reactivate old bad habits by mouthing new words. Thus, moribund sectors that only ever operated due to extensive reliance on slave labor, external support from the former Soviet Union, and obsolete and incredibly inefficient technology (such as making fertilizer from coal) should not

economy, can remove 4.3 percent deviations in the distribution plan of supplies and reduce to 3 months the process of dovetailing work among sectors, which took 5 to 6 months. Other remarkable programs were “*Manpung-ho*” (Lake Manpung) version 2, a land adjustment design program; “*Supung*”, a supporting program for production planning hydroelectric power plants; “*Tamsaek-1*” (search), a supporting program for crude oil-probing projects. These programs were developed in order to solve urgent problems, which now confront the construction of the DPRK’s socialist economy.

⁷⁵ In this regard, the United States must make a choice: will it allow transfer of market-oriented planning software to the DPRK to support the transition, or continue to block it. In our own experience, the Commerce Department would not tell a software supplier willing to provide a free copy of Long Range Energy Alternatives Planning (LEAP) software to our DPRK counterparts whether they would be breaking US export laws, even after the sanctions were lifted. To date, the software still has not been transferred.

be maintained let alone be viewed as the basis for new industries in the DPRK. Bulldozers are most appropriate in such circumstances.

The third risk is that the party bosses become the new billionaire entrepreneurs running horizontally and vertically integrated trading and manufacturing empires inside and outside of the DPRK. The shift from an absolutist and monarchic state buttressed by modern means of totalitarian control to an entrepreneurial elite will be difficult in the DPRK without immense corruption as party leaders translate their political power into economic power. Eventually, this dynamic may lead to conflict between the emerging political-corporate and the old military-industrial elites -- perhaps when the former try to sell real estate north of Seoul on the DMZ -- long the exclusive preserve of the DPRK military. Who can tell -- but the fusion of political, economic and military power in the DPRK polity and its slow but necessary dissolution into its separate elements such that a modern, and likely authoritarian, market state can emerge is fraught with peril for which there is little precedent.

Social Networks

Unlike many DPRK observers, this author does not believe that the population, especially the intermediate managers at the provincial and local levels, is ignorant of their absolute and relative deprivation. While they may not know whether the stock market was up or down the previous day in Seoul, they know whether they were hungry on any given day. And, they know a great deal about the external world, including about the ROK and its economy. This decentralized knowledge arose from the social-control system itself in the pyramid of power that culminates in Kim Jong Il. In short, the tighter the control, the faster the

circulation of elites at every level as the surveillance and control systems broke up potential alignments of opposition to the party and its leadership. Like detergent in a washing machine, this circulation system ensures that ignorance was washed away, even in the furthest reaches of the control system.

Now that the DPRK elite itself has declared that the old model has failed, the population's private knowledge obtained via personnel circulation and their stomachs is consistent with the public line of the leadership. Thus, ordinary or elite North Koreans "discovering" that they are absolutely and relatively deprived, or that they have been lied to should not create any political instability. No news in that for most North Koreans—they are not stupid.

The confidence of the DPRK leadership in the face of constant defection is otherwise inexplicable. To the DPRK leadership, defection represents a gain, not a loss. It draws on the resources of the Korean diaspora to reduce the economic pressure on the DPRK distribution system. It creates new trading networks across the borders with China and the Russian Federation. It exports alienated Koreans to become someone else's problem. And it tests the loyalty of those elite Koreans who choose to stay and live with the cultural dissonance of their cosmopolitan identity in the context of the narrow options offered by living in the DPRK. Thus, we have seen the apparent contradiction of accelerating defections with increasing opportunity for elite North Koreans to travel and study abroad—hardly the mark of a frightened leadership.

Until labor markets evolve in such a way that would allow North Koreans to travel and work in substantial numbers in the ROK, most North Koreans are likely to stay put. The creation of networks that support social connection and

cultural identity without travel and at low cost are therefore very important to the political and social stability of the DPRK. In this intensely conservative culture, especially in the rural areas, networks that provide near-zero cost financial remunerations from migrant laborers and overseas relatives will enable very poor Koreans to supplement their meager existence whatever happens in Pyongyang and Yongbyon.

In a similar vein, providing networked support for family cyber-unification and contact for documenting the lost generations of Koreans in the North from the colonial, war, and post-war periods, for creating online but at-distance repositories for photographic and other cultural archives, and for the exploration of a hybrid Korean identity in the midst of the globalization -- these and many other tasks will be undertaken by decentralized, non-state actors with the new tools of the enabled Internet. The shape and timing of these outcomes cannot be predicted except that they are likely to happen before we expect, and in ways that are currently unimaginable. They will happen anyway because motivated humans always find ways to communicate with each other.

Table 4.2: Indicators of Emerging e-DPRK

SEPTEMBER 2002

- North says it opened homepage for joint venture company
- Morning-Panda Joint Venture Computer Company commissioned
- South Korea's IT investment to North amounts to \$8.7 million

- Economic delegation from North Korea looking around one of the factories of Samsung Electronics in Suwon, South Korea on Thursday

AUGUST 2002

- Professors Return from NK Exchange
- Malaysia's IT delegation arrives in Pyongyang
- Pyongyang opens business-friendly computer center [Website][e-commerce]

JULY 2002

- Computer lecture room installed in Grand Study Hall
- U.S. opposes plan for phones in North
- North Korea develops pen-based computer
- North Korea develops keyboard-free computer system

JUNE 2002

- Animation world of North Korea
- (DPR)Korea Lotto Joint Venture
- Seoul official upbeat on North's IT sector
- N.K. invites Korean-run IT firms in U.S.
- Chinese, N.K. Firms Set up Joint-Venture PC Company in Pyongyang
- North Korea's Policy Shift Toward the IT Industry and Inter-Korean Cooperation
- Northern IT center in search of orders from abroad
- Pyongyang to host international forum on IT

MAY 2002

- Pyongyang opens its first Internet café

- Venture team cuts ribbon on PC room Pyongyang
- North Korea nurtures IT to push economic growth
- N. Korea Holds Software Trade Show
- First E-Business Center Opens in N. Korea

APRIL 2002

- DPRK software expo in Beijing?
- N.K. demands its nation to be listed in MS operating system
- North Korea Unveils Software Industry
- Korea, Vietnam Forge IT Cooperation
- NK Leader Regularly Surfs ROK Websites

